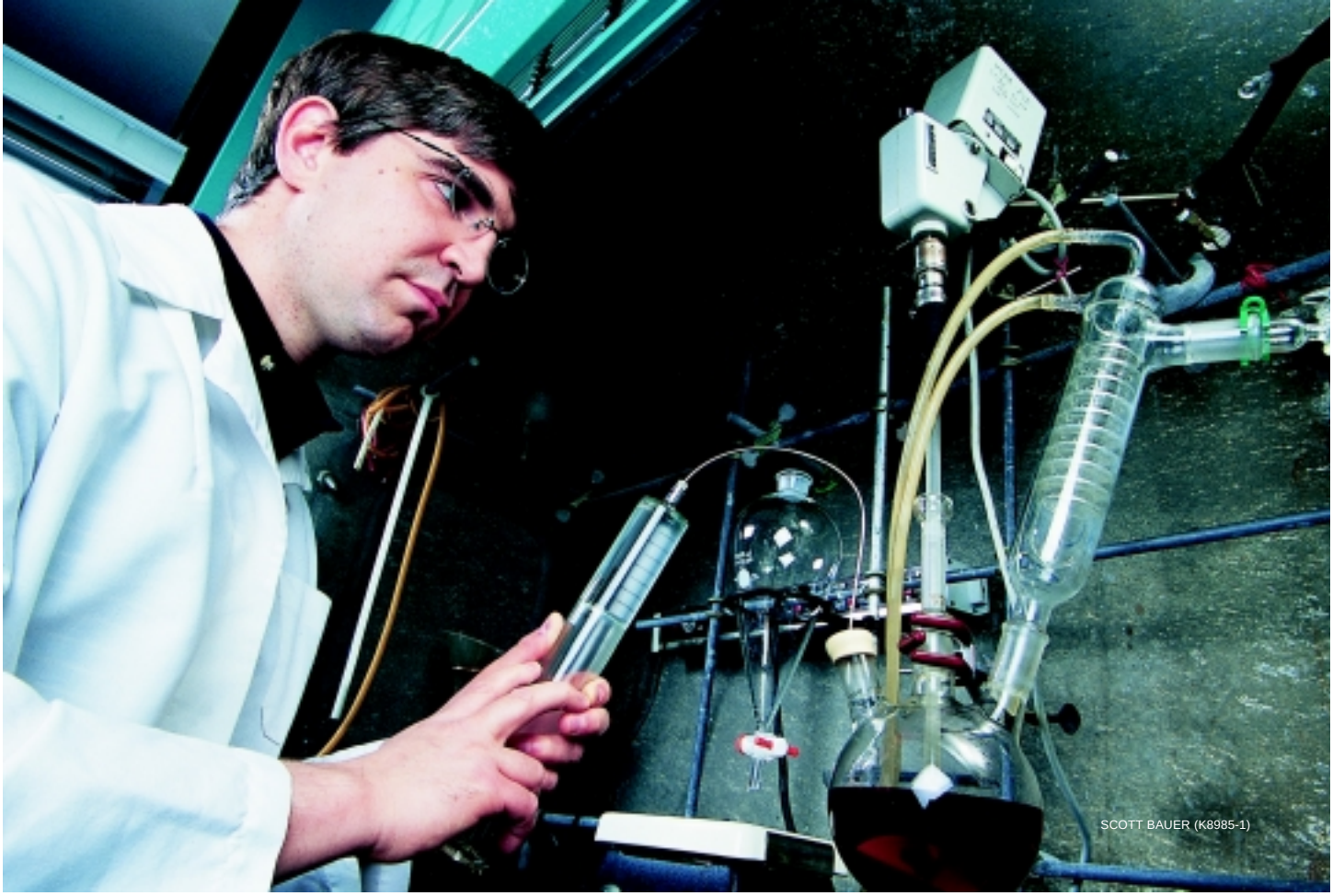

Chemist Andre Raw synthesized a new medfly attractant that lasts about three times longer than trimedlure, a commonly used attractant.

A Better Bait for Medfly

Only half the size of a pencil eraser, the tiny Mediterranean fruit fly—or medfly—impels hundreds of state and federal agents annually to deploy some 150,000 traps baited with the male medfly attractant trimedlure. The traps are key in federal and state programs to keep the fly—one of the worst agricultural pests worldwide—out of the mainland United States.

If some medflies *(Ceratitis capitata)* should sneak into the country and wind up in a trap, that will start a chain reaction. Thousands more traps will be deployed to help keep the six-legged hooligans confined to an area where they can be snuffed out.

Even in relatively problem-free years, well over a million trimedlure dispensers are sold in the United States to keep the traps effective. Now, ARS is patenting a compound that stays potent in the traps about three to four times longer than trimedlure, according to early testing by ARS entomologist Eric B. Jang in Hawaii, where the medfly is an established pest. This could dramatically cut the number of times the traps need restocking—a labor-intensive job.

More importantly, the compound—nicknamed "minus-ceralure" by its discoverers—is about four to nine times more attractive to medflies, Jang found, so its vaporous tendrils can capture more hapless males. This would make the monitoring program more foolproof.

"It's more likely you'll capture the first invaders before the infestation becomes established," says chemist Andre S. Raw, formerly with ARS. Now with the Food and Drug Administration's Center for Drug Evaluation Research in Rockville, Maryland, Raw synthesized the compound in Beltsville, Maryland. He says it has enough oomph that it could potentially be used for mass-trapping to eradicate the flies.

Baiting traps with an attractant such as minus-ceralure, Raw continues, "is more environmentally sound than spraying insecticides and may be less expensive than releasing sterile male medflies." These laboratory-reared, infertile males are set loose by the millions when their wild counterparts are detected in traps. This prevents wild flies from homesteading because no viable offspring result from a union between sterile males and fertile females.

Not Just a Local Problem

Medfly woes aren't limited to the United States. The insect is a major agricultural pest in Europe, Africa, Australia, Pacific areas, and Central and South

America. That's good reason for the researchers to patent the new compound for worldwide use.

To help bring minus-ceralure to market, ARS is seeking a new cooperative research and development agreement with the Farma Tech International Corporation in Fresno, California, which has historically commercialized medfly controls.

Working at the ARS Insect Chemical Ecology Laboratory, Raw teased out the potent attractant from among the 16 isomers that make up minus-ceralure's parent compound, ceralure. Developed in Beltsville and Hawaii and patented in 1988, ceralure's 16 isomers have the same chemical formula, but each differs in its 3-dimensional structure. The most attracting of these turned out to be minus-ceralure B1.

Birth of a New Bait

Ceralure's inventors, chemists Roy T. Cunningham—now retired from the Hawaii laboratory—and the late Terrence P. McGovern, from the Beltsville laboratory, pinpointed several isomers that they thought were key to ceralure's effectiveness. But limitations of laboratory technology during the 1980s and early 1990s made it impossible for them to extract and purify a large enough quantity to test on the insects.

Using modern techniques, Raw developed a 9-step synthesis that yields 1 gram of isomer for every 7 or 8 grams of starting material—a yield of 15 percent. His innovative procedure is a central part of the new patent he and Jang are seeking ("Attractant for the Mediterranean Fruit Fly, the Method of Preparation and Method of Use," U.S. Provisional Patent Application No. 60/176,192). And it produced enough of the isomers to supply small vials of the clear liquid for Jang to use in outdoor tests with caged and free-roaming medflies.

For the outdoor testing, Raw chose to purify two candidate isomers that had most intrigued both Cunningham and McGovern. Later, Jang's tests in Hawaii showed that minus-ceralure B1 was the best of those isomers.

The Beltsville laboratory continues to search for more efficient synthesis of minus-ceralure. Large-scale production of this powerful attractant must be economical before it can be routinely used in thousands of traps.

Meanwhile, Experiments Offshore

Jang's tests—some 5,000 miles away in a leafy commercial macadamia nut orchard—will help determine how long very small quantities of the chemical remain attractive under all sorts of weather conditions.

"We're seeing how well the lure holds up through our hot, humid days and our torrential downpours," he says.

The orchard, which looks somewhat like a grove of pecan or walnut trees, is about a 10-minute drive from Jang's laboratory at the U.S. Pacific Basin Agricultural Research Center. The grove makes an ideal site for the outdoor trials because the trees aren't a host of medfly. That makes it easier for Jang, technician Lori Carvalho, and others on the Hilo team to gauge minus-ceralure's appeal to the thousands of sterile medflies they rear in their lab and then set free in the grove.

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Mediterranean fruit fly, a worldwide agricultural pest.

They dab various quantities of minus-ceralure on cotton wicks inside the traps, then hang the traps at carefully spaced intervals throughout the orchard. Next, they turn the flies loose and check the traps every few days to see which concentrations of the lure attract the most medflies for the longest period. The orchard's neat, precise rows of trees make a perfect grid for laying out these mathematically correct, statistically sound field studies.

"We want to pinpoint the least amount of chemical that we can use for the longest lasting trap," says Jang. "Cost-effectiveness is particularly important with minus-ceralure because—for now, anyway—it costs significantly more to produce than trimedlure."

Minus-ceralure and ceralure are among the newest tropical fruit fly lures to emerge from the strong 40-year collaboration between scientists at Beltsville and their counterparts in Hawaii. Ceralure is a modification of trimedlure—which Beltsville and Hawaii scientists invented and is now the world's most widely used medfly attractant.

Today, minus-ceralure ranks as the best medfly attractant yet reported. The researchers are looking to improve on this discovery. Jang, for instance, is continuing analyses of other promising chemicals. Their work may lead to an even more potent lure for the destructive medfly.—By **Judy McBride** and **Marcia Wood,** ARS.

This research is part of Crop Protection and Quarantine, an ARS National Program (#304) described on the World Wide Web at http://www.nps.ars.usda.gov/programs/cppvs.htm.

Eric B. Jang is at the USDA-ARS U.S. Pacific Basin Agricultural Research Center, Stainback Hwy., P.O. Box 4459, Hilo, HI 96720; phone (808) 959-4340, fax (808) 959-4319, e-mail ejang@pbarc.ars.usda.gov. ◆